

**Antennal Tuft Organs of
Pediculus humanus Linn. and *Phthirus pubis* (Linn.)
(Anoplura: Pediculidae)**

FREDERICK H. MILLER, JR.

PARASITOLOGY SECTION, DIVISION OF MICROBIOLOGY
DEPARTMENT OF PATHOLOGY AND LABORATORIES
MEADOWBROOK HOSPITAL, EAST MEADOW, NEW YORK 11554

RECEIVED FOR PUBLICATION MARCH 18, 1969

Abstract: Scanning electron microscopy reveals two tuft organs each with an average of six hairs in *Pediculus humanus* Linn. Similarly located tufts of *Phthirus pubis* (Linn.) average nine hairs. Two pore organs on the fifth antennal segments of both these lice are also described.

The antennal tuft organ of *Pediculus humanus* Linnaeus was described by Keilin and Nutall (1930) as a tuft of four sensory hairs with a tube penetrating into a sensory ganglion. Only one such organ was pictured on their plate of the antenna of the first instar of *P. humanus*. Wigglesworth (1941) referred to three such structures on the dorsolateral aspect of the terminal segment and one at the apex of the fourth segment on the lateral side of the antenna. His illustration of the tuft showed it to consist of four delicate hairs on a cone which arises from within the antenna. This description has been repeated in many texts. The scanning electron microscope allows this structure to be described more accurately.

MATERIALS AND METHODS

This study is based on 96 specimens of *P. humanus* representing six different populations. Two of the populations were head lice from North America and the remaining were body lice from North America and Mexico, including one from a laboratory colony which had been reared on rabbits for many generations. Twelve specimens of *Phthirus pubis* (L.) from Europe were also examined. Males and females from each population were studied and the nymphal stages

Acknowledgments: The writer wishes to thank Dr. George S. Tulloch, presently at Brooks Air Force Base, Texas; Dr. Austin Frishman of the N. Y. State University at Farmingdale, N. Y.; and Dr. William L. Jellison of Parker-Davis Memorial Library, Montana for their contributions of the various populations for this study. A special thanks is due Dr. Irwin H. Gilbery of the United States Department of Agriculture, Research Division at Gainesville, Florida for supplying the stock from which the laboratory colony was established.

I am grateful to Mrs. Doris Johnson and Miss Dolores Krause for their technical assistance. My sincere thanks to Doctors John L. Duffy and Irving Abrahams of Meadowbrook Hospital, and to Dr. Janardhan G. Butte of the N. Y. State University at Farmingdale for their discussions and reading the manuscript.



were examined from the laboratory colony. The specimens were fixed in 70% alcohol. Intact lice were mounted on metal specimen holders using aluminum paint for both adhesion and grounding. The paint was air dried and the specimens were then coated with gold in a vacuum chamber. They were studied under the scanning electron microscope, a Cambridge Steroscann Mark II, at 20KV.

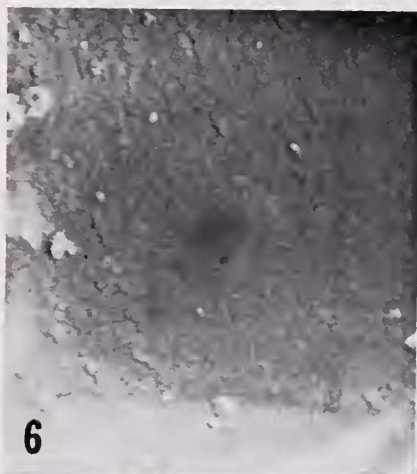
OBSERVATIONS AND DISCUSSION

Ferris (1951) indicated that there is no sexual dimorphism of the antennae in either *Pediculus* or *Phthirus* lice. Scanning electron microscopy confirms this. Examination of the *P. humanus* antennae revealed only one tuft organ on the dorsolateral aspect of the fifth, or terminal, segment (Fig. 1). Contrary to Wigglesworth (1941) no other similar structures could be located despite a diligent search. However, two pore organs were seen in the approximate locations where he had reported the tufts to be. These pore organs consist of a series of slits measuring approximately 0.3 microns in length, surrounding a smaller central opening (Fig. 6). The outside diameter of the circle of slits is approximately 3 microns. Several of these pore organs showed the presence of a precipitation around the slits and central opening (Fig. 7). These structures were present in all the lice studied, and it might be that they were mistaken for tuft organs. Studies are being continued to determine the function of these pores.

A tuft organ found on the dorsolateral aspect of the fourth segment is morphologically similar to that on the terminal segment. The tuft organ is composed of a cluster of finger-like projections arising from the apex of a stalk, the base of which is not seen as it descends through an opening. This opening is 2.5 to 3.0 microns in diameter. In some of these organs the apex protrudes through the opening, whereas in others it is retracted. The number of finger-like projections, referred to in the literature as hairs, were found to vary from four to seven. Four finger-like projections were seen only on the first instars (Fig. 2) of the laboratory colony. In the adult organs, those with six hairs (Fig. 3) occurred most frequently. The four tuft organs on a single louse often exhibited a variable number of hairs present with no detectable pattern as to sex. However, the larger number of hairs usually appeared on the tufts of the fourth segment when they did differ. There is suggestive evidence that the four hairs may split to form six or seven hairs (Figs. 4 and 5). The individual intact hairs of adult lice measure approximately 2 to 3 microns in length and 0.3 microns in width. The individual hairs of the tuft of the first instar varies considerably in length from 1 to 4 microns.

←

FIGS. 1-5 Antennal tuft organs of *Pediculus humanus*. 1. 4th and 5th antennal segments. $\times 900$. 2. 4 hairs of first instar. $\times 6,300$. 3. typical 6 hairs. $\times 5,700$. 4. splitting of 2 hairs on first instar. $\times 5,700$. 5. splitting of a hair on adult. $\times 5,800$.



No previous description of the tuft organ of *Phthirus pubis* was found in a review of the literature. In this species two organs were found on each antenna. One was centrally located on the dorsolateral aspect of the fifth, or terminal, segment and the second was found in close proximity to a seta on the lateral, subapical end of the fourth segment (Fig. 8). The tuft organs are morphologically similar to each other. The essential difference between the tufts in this species as compared with *P. humanus* is in the number of hairs arising from the apex of the stalk. The average number of tuft hairs is nine but this number can vary from eight to ten hairs (Figs. 9 and 10). Again the larger number of hairs was usually seen on the tuft organ of the fourth segment. Two pore organs were seen on the fifth, or terminal, segment in approximately the same location as was seen on *P. humanus*.

The two genera reported in this study are similar in the following respects: in the morphological appearance of the tuft organs, in the absence of sexual dimorphism and in the position of the tuft hairs, and in the presence of two previously undescribed pore organs on the fifth, or terminal, segment.

Literature Cited

- FERRIS, G. F. 1951. The Sucking Lice. Pacific Coast Entomol. Soc. 320 pp., illus.
KEILIN, D., AND G. H. F. NUTALL. 1930. Iconographic Studies of *Pediculus humanus*.
Parasit., **22**: 1-10.
WIGGLESWORTH, V. B. 1941. The Sensory Physiology of the Human Louse *Pediculus humanus corporis* De Geer. Parasit., **33**: 67-109.

←

FIGS. 6-7 Antennal pore organs of *Pediculus humanus*. 6. pore organ on fifth segment. × 5,730. 7. precipitant covering pore organ. × 2,800.

FIGS. 8-10 Antennal tuft organs of *Phthirus pubis*. 8. 4th and 5th antennal segments. × 1,200. 9. typical nine hairs. × 5,700. 10. ten hairs on adult. × 7,000.